

Studies on Schismatoglottideae (Araceae) of Borneo XIII: A Revision of the *Schismatoglottis nervosa* Species Complex

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Abstract

A revision of the *Schismatoglottis nervosa* Ridl. species complex is presented. Ten species are recognized, of which three species are pre-existing (*S. nervosa*, *S. elegans* A.Hay, and *S. brevicuspis* Hook.f.) and seven are novel and described here (*Schismatoglottis adoceta* S.Y.Wong, *S. liniae* S.Y.Wong, *S. matangensis* S.Y.Wong, *S. simonii* S.Y.Wong, *S. tessellata* S.Y.Wong, *S. turbata* S.Y.Wong, and *S. ulusarikeiensis* S.Y.Wong.) The *S. nervosa* species complex is readily delimited by the pungent terpenoid smell when the vegetative tissues are crushed, and by the presence of longitudinally ridged petioles. A key to the *S. nervosa* species complex is presented and all species are illustrated.

Introduction

Schismatoglottis is a genus of in excess of 150 species of terrestrial, lithophytic, and rheophytic herbs occurs within Malesia, but mainly in Borneo. Hay & Yuzammi (2000) presented an alpha-taxonomic revision of the Malesian species, one of the results of which was the recognition of six informal species groupings based primarily on shoot architecture and the senescence mechanics of the upper spathe: Asperata Group, Calyptrata Group, Corneri Group, Multiflora Group, Rupestris Group and Tecturata Group. However, *Schismatoglottis* has been proven as a polyphyletic assemblage (Wong *et al.*, 2010), and this has resulted in the removal of the Rupestris Group into a resurrected genus, *Apoballis* (Wong & Boyce, 2010). Further molecular analysis is being undertaken and will form the basis of further paper (Ting *et al.*, in prep.).

Hay and Yuzammi (2000) placed *S. nervosa* and *S. elegans* (both from Sarawak) in the Asperata Group based on the combination of pleioanthic shoots, the leaf sheath open and nearly always fully attached and persistent, and by the spathe limb opening more-or-less wide and then crumbling-

deliquescent. One species, which occurs in West Malaysia, *Schismatoglottis brevicuspis* Hook.f also belongs to this complex. In addition to these species, a further 7 species, all novel, are recognized here from Sarawak: *Schismatoglottis adoceta* S.Y.Wong, *S. linae* S.Y.Wong, *S. matangensis* S.Y.Wong, *S. simonii* S.Y.Wong, *S. tessellata* S.Y.Wong, *S. turbata* S.Y.Wong, and *S. ulusarikeiensis* S.Y.Wong. The *S. nervosa* species complex is clearly distinguished within the Asperata Group by a pungent terpenoid smell when crushed (tissues odourless when crushed in Asperata Group *s.str.*, i.e., *sensu* Wong), coriaceous to thinly coriaceous \pm elliptic leaves with veins prominent abaxially (leaves thinly sub-succulent and fragile with veins obscure to invisible abaxially in Asperata Group *s. str.*), and longitudinally ridged petioles (petioles asperous to puberulent or hispid in Asperata Group *s. str.*), supporting the recognition as a distinct species complex within the group.

The *S. nervosa* species complex comprises terrestrial forest-dwelling herbs commonly on steep soil banks or occurring as obligate or facultative lithophytes on limestones, shales, sandstones and granite. *Schismatoglottis nervosa* and *S. elegans* are restricted to Karst limestones; *Schismatoglottis matangensis* and *S. turbata* to sandstones, and *S. adoceta*, *S. tessellata* and *S. ulusarikeiensis* to shales, *S. simonii* to both limestones and sandstones, and *S. linae* and *S. brevicuspis* to granite.

Allied taxa

There are additional species in the *S. asperata* group that possess longitudinally and/or puberulent ridged petioles and/or are weakly (not pungently) terpenoid smelling when crushed, of which one, *Schismatoglottis latevaginata* Alderw., described and numerous other species are awaiting formal description. Based on initial observations of the spathe senescence mechanics (spathe at least partially circumscissile before shedding in large pieces) and leaf shape (lamina oblongo-ovate on a disproportionately long petiole), these species are morphologically more closely related to one another than any of them are to species of the *S. nervosa* species complex, and will be the subject of a subsequent paper.

Schismatoglottis nervosa species complex

Small to robust **herbs**, 40-70 cm tall, occasionally up to *ca* 1 m tall, with vegetative tissues emitting a pungent aromatic (terpenoids) smell when crushed. **Stem** epigeal, pleionanthic, erect to decumbent, sometimes ascending and then rooting ('terrestrial climber' *sensu* Boyce), 30-50 cm

long x 2-4 cm thick, adventitiously branched from older portions, rooting along entire length on contact with ground, roots often penetrating petiole bases; leaf scars prominent. **Leaves** few to many (5-15) together; innovations yellowish green; senescent lamina sometimes rotting and falling together with distal portion of petiole to leave the lower portion of the petiole attached to plant, this rotting and falling at a later stage; petioles terete, *ca* 30-40 cm long, sometimes, up to *ca* 70 cm long, adaxially channelled or D-shaped in cross section, weakly to strongly longitudinally ridged (resembling celery - *Apium graveolens* - Apiaceae) especially abaxially, minutely (strong lens required) and densely verruculate or glabrous; petiole sheathing in the lower $\frac{1}{3}$ - $\frac{1}{2}$, sheaths fully attached, thinly coriaceous, sometimes leathery, marcescent or persistent, tapering, closed or less often wide open, sometimes with a short rounded free ligular portion; lamina broadly ovate to oblongo-ovate to elliptic, coriaceous or thinly coriaceous, base broadly rounded to sub-truncate, slightly retuse or cuneate, apex acute to strongly acuminate, adaxial surface semi-matte, bright deep to medium green, always slightly bullate, abaxial surface paler green, often glaucous, drying strongly discolorous; midrib adaxially flush with lamina, abaxially very prominent; primary venation impressed adaxially, sometimes flush with lamina, strongly raised abaxially, alternating with lesser interprimaries, interprimaries occasionally arising from the bases of the primary veins, both diverging at 45°- 90° and gradually curving towards the apex before reaching the intermarginal collecting vein; secondary venation mostly arising from the midrib, occasionally from near the bases of the primary veins, prominent abaxially; tertiary venation forming an obscure to prominent tessellate pattern, variously prominent adaxially and abaxially. **Inflorescences** up to three together (rarely 4), erect, white, moderately fragrant (esterase) at female anthesis; peduncle to *ca* 2 cm long, concealed by leaf bases, prophylls, and cataphylls at flowering, slightly exerted in fruit; **spathe** interior glossy, exterior semi-glossy; lower spathe differentiated from the limb by a weak constriction correlating with spadix interstice; limb oblongo-lanceolate, white to partially green, weakly coriaceous to somewhat spongy, semi-truncate to shortly to strongly acuminate (to *ca* 5 mm long), apex mucronate (to *ca* 2 mm), limb either caducous by crumbling at or just after male anthesis, with remaining fragments deliquescing, or briefly persistent until end of anthesis and thence deliquescent; spadix sessile, isodiametrically adnate on the lower abaxial side relative to the spathe opening; **female zone** conic-cylindric; pistils numerous, close-packed or laxly arranged; stigma sessile, punctiform, minute to large but always smaller in diameter than ovary; interpistillar staminodes confined to a more-or-less single ring at the base of the female zone (rarely among the pistils); sterile interstice present, supra-pistillate pistillode zone often constricted; pistillodes half to twice the diameter of

ovary, close-packed or laxly arranged and followed by a whorl of staminodes, this zone often constricted; **male zone** contiguous with interstice staminodes, cylindric; stamens close-packed, the whole butterfly or dumbbell-shaped from above; pores oblong to C-shaped, deep to shallow; appendix sub-cylindric, white or yellow when fresh, distally tapering to a blunt or sharp point, basally merging with the male zone or weakly or distinctly wider and slightly truncate; appendix staminodes small to rather large, densely packed, flat-topped to slightly impressed, irregularly polygonal.

Key to *Schismatoglottis nervosa* species complex

1. Petiole longitudinally ridged; vegetative tissues pungently aromatic (terpenoids) when crushed; leaves \pm elliptic, thickly to thinly coriaceous with veins prominent abaxially.....2
1. Not the above combination remainder of genus (see Hay and Yuzammi, 2000; Hay, 2002)
2. Spathe hardly opening; upper part of spathe limb remaining green during anthesis; stigma green when fresh.....3
2. Spathe opening wide; upper part of spathe turns to white during anthesis; stigma white when fresh (except for *S. tessellata*).....4
3. Petiolar sheath persistent, opening wide; lamina longer and narrower (ratio $\geq 3:1$); primary venation adaxially flush with surface and with less than 10-15 on each side. Central Sarawak: Sarikei.....***S. ulusarikeiensis***
3. Petiolar sheath marcescent, opening narrow; lamina shorter and wider (ratio $< 3:1$); primary venation adaxially sunken with surface and with 15-20 on each side. West Malaysia: widespread.....***S. brevicuspis***
4. Appendix white when fresh; petioles puberulent, densely (sometimes minutely) verruculate, longitudinal ridges prominent; leaf apex shortly acuminate to *ca* 1 cm.....5
4. Appendix yellow when fresh; petioles glabrous, not verruculate, longitudinal ridges not prominent; leaf apex strongly acuminate to *ca* 3 cm.....9
5. Tertiary venation obscure-tessellate; female zone exceeding male zone, pistils laxly arranged, stigma small, $\frac{1}{5}$ of ovary diam., turning yellow in alcohol; spadix interstice sharply constricted. West Sarawak: Matang.....***S. matangensis***
5. Tertiary venation prominent tessellate; male zone exceeding female zone, pistils crowded, stigma large, $\frac{1}{3}$ to $\frac{1}{2}$ of ovary diam., remaining white in alcohol; spadix interstice weakly constricted. Plants of limestone, sandstone and granite. West Sarawak except Matang6